NEW RECORDS AND SYNONYMIES OF BERMUDA OPISTHOBRANCHS (GASTROPODA)[1]

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ABSTRACT

Twenty species of Bermudian opisthobranchs are listed and described, representing significant range extensions, synonymies, or redescriptions of poorly known species with Bermuda type localities. Some biogeographic relationships are discussed. The Bermudian opisthobranch fauna is heavily dominated by a Caribbean component. Species with long pelagic development are often found in low densities, suggesting that this faunal component is recruited allochthonously. Species with encapsulated metamorphosis appear to be better adapted to the island habitat of Bermuda.

Much of the Bermudian opisthobranch fauna was described in the late nineteenth and early twentieth centuries, a period in which most taxonomic descriptions were unfortunately brief, and frequently deficient in the diagnostic characteristics presently used for the separation of species. Approximately 25 original descriptions are from Bermudian coastal waters (Heilprin, 1888; Simroth, 1895; Verrill, 1900, 1901; Smallwood, 1910; Russell, 1935). About 20 of these were described by Verrill. Verrill's descriptions are generally the poorest, usually omitting any reference to internal anatomy, as well as lacking detailed descriptions of external anatomy; his figures were often somewhat stylized and were reproduced at a scale which obscures much detail. These deficiencies are compounded by the apparent loss of most of Verrill's holotypes (Willan, 1978).

Bermuda lies reasonably close to the Antillean Archipelago, and is within the influence of the Gulf Stream, thus should share many species with the Caribbean fauna. Without dependable Bermudian descriptions for comparisons, it is impossible to characterize the Bermuda fauna or the Caribbean fauna accurately; older species cannot be compared with new species, and there may be synonyms among previously described Bermudian and Caribbean species.

The purpose of this study is to redescribe some Bermuda Opisthobranchia in order to clarify the status of these species. Additionally, some information on habitats and diets of Bermuda species is presented, with several new records for these islands.

Material Examined

Most of the specimens studied were collected in August 1979 from various sites in eastern Bermuda. Samples were collected by several techniques. Most were collected by vigorously shaking algae, hydroids, etc. underwater, then collecting the dislodged opisthobranchs with a suction collector (Clark, 1971). Others were collected by direct visual inspection of potential substrates. Additional materials were examined in the museum collection of the Bermuda Biological Station (BBS), representing a variety of habitats and seasons; however, the majority of the material examined was collected in summer, and probably represents only a portion of the complete Bermudian opisthobranch fauna. Materials listed were collected by the author unless otherwise noted.

List of Species

Subclass Opisthobranchia

Order **Cephalaspidea**

Runcinidae

1. *Runcina divae* (Marcus & Marcus, 1963)

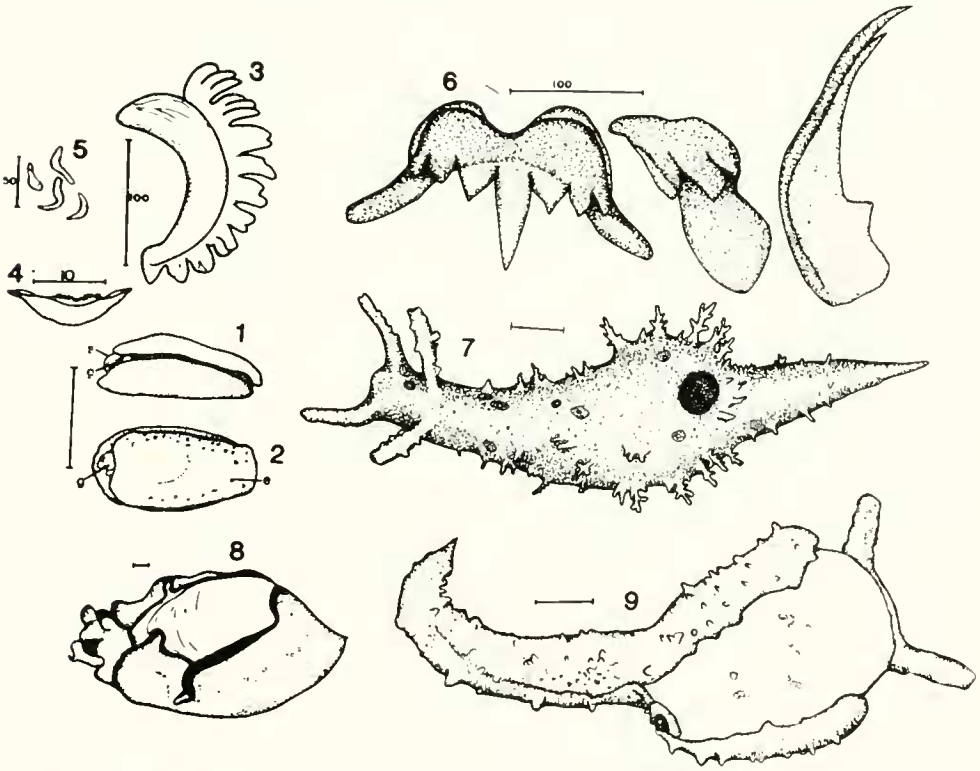
[1]Contribution No. 984 of the Bermuda Biological Station.

Order **Anaspidea**
Notarchidae
2. *Stylocheilus longicauda* (Quoy & Gaimard, 1824)
Aplysiidae
3. *Aplysia parvula* Mörch, 1863
Order **Ascoglossa**
Volvatellidae
4. *Volvatella bermudae* Clark, 1982
Oxnoidae
5. *Oxynoe antillarum* Mörch, 1863
Elysiidae
6. *Elysia subornata* Verrill, 1901
7. *Elysia papillosa* Verrill, 1901
8. *Elysia tuca* Marcus & Marcus, 1967
9. *Elysia flava* Verrill, 1901
Boselliidae
10. *Bosellia mimetica* Trinchese, 1890
Caliphyllidae
11. *Cyerce antillensis* Engle, 1927
12. *Cyerce cristallina* (Trinchese, 1881)
Costasiellidae, **new family**
13. *Costasiella ocellifera* (Simroth, 1895)
14. *Costasiella nonatoi* Marcus & Marcus, 1960

Order **Pleurobranchacea** (Notaspidea)
Pleurobranchidae
15. *Berthella agassizii* MacFarland, 1909
Order **Nudibranchia**
Suborder Doridacea
Chromodorididae
16. *Chromodoris bistellata* (Verrill, 1900)
Goniodorididae
17. *Okenia zoobotryon* (Smallwood, 1910)
Suborder Dendronotacea
Tritoniidae
18. *Tritoniopsis frydis* Marcus & Marcus, 1970
Suborder Aeolidacea
Favorinidae
19. *Favorinus auritulus* Marcus & Marcus, 1955
Facelinidae
20. *Dondice occidentalis* (Engel, 1925)

Descriptions

1. *Runcina divae* (Marcus & Marcus, 1963)
New combination
(Figs. 1-5)



FIGS. 1-5. *Runcina divae*. **1.** Right lateral view; **2.** Dorsal view (**e**-eye; **g**-gill; **s**-shell). **3.** Gizzard plate. **4.** Rachidian tooth. **5.** Lateral teeth. FIGS. 6-9. *Stylocheilus longicauda*. **6.** Radular teeth (r-rachidian; m-marginal; l-lateral). **7.** Living animal, from photo. **8.** *Aplysia parvula*, preserved animal. **9.** *Oxynoe antillarum*, partially relaxed.

Synonymy:
Ildica divae Marcus & Marcus, 1963 (Pp. 7–9, Figs. 1–7; Piscadera Bay, Curaçao).
Lapinura divae (Marcus & Marcus, 1963) (Marcus & Marcus, 1970, pp. 19–22, Figs. 20–26).

Localities: East side of Trunk Island, depth 1 m, on *Codium* (coll. by W. Sterrer); North side of causeway, Castle Harbor, on *Caulerpa racemosa*.

Description: Length, 1-2 mm; body smooth, elongate elliptical, with lateral groove separating body into ventral foot and undivided dorsal mantle. Color reddish brown. Plicate gill of several indistinct lobes located near midline of hind end, partially covered by overlapping end of posterior mantle. Shell, when present, small, hyaline, located to left of gill and also partially obscured by mantle (Figs. 1, 2). Eyes and digestive gland faintly visible through mantle of living animal (Fig. 2). Gizzard with about 10 ridges (Fig. 3); radula 21-23 × 1:1:1; laterals variably hooked, rachidian tooth with about 18 very delicate denticles on weakly notched central cusp (Figs. 4, 5).

Comments: The external shell was absent in most specimens (about 75%) from Trunk Island, and present in most from Castle Harbour; its absence was confirmed by dissection and by sodium hydroxide treatment of several animals during radula removal. The median notch of the rachidian tooth was somewhat less distinct than described by Marcus and Marcus (1963).

Presence of an exposed larval shell in the adult animal was used by Marcus & Marcus (1970) to define the genus *Lapinura*. However, the variability of this character in Bermudan populations of this species indicates that this character cannot be used to establish a separate genus. This characteristic may be ontogenetically variable, with loss of the shell occurring sometime between juvenile and adult phases in some animals. If one disregards presence of the larval shell, then major characteristics of this species (radula 1:1:1, 4 gizzard plates) clearly place it in *Runcina* (see Kress, 1977).

Verrill's *Runcina inconspicua* (1901) differs in the presence of orange or violet marginal bands on notum and foot, and the gill was described as composed of fine filaments, so *inconspicua* must be distinct from *divae*.

2. *Stylocheilus longicauda* (Quoy & Gaimard, 1824)
(Figs. 6, 7)

Synonymy:
Aplysia longicauda, Quoy & Gaimard, 1824 (New Guinea).

Locality: eastern Bermuda; collection data for the single animal in the Bermuda Biological Station are missing. Tucker Abbott informs me (*in litt.*) that he has collected this species intertidally on the southshore of Tucker's Town. However, this species typically occurs in reef rubble, associated with fine filamentous rhodophytes.

Description: a color photograph of the specimen shows typical coloration for this species, a mottled greyish body with orange-ringed iridescent blue eyespots scattered over the dorsal mantle.

3. *Aplysia parvula* Mörch, 1863
(Fig. 8)

Locality not given; collected 10 June 1979, W. Sterrer.

Description: This species is easily recognized as a small *Aplysia* with a narrow foot, and black parapodial margin, rhinophore tips, and foot borders; body light brown with small lighter mottlings. The preserved specimen is 17 mm long, with the relatively large shell plate (½ of body length) lightly calcified and chalky.

4. *Volvatella bermudae* Clark, 1982

Locality: On *Caulerpa racemosa* on vertical rock faces, 1-3 m.

Description: Strong, channeled shell with apical "spout"; mantle green, foot white. This species was believed to be endemic to Bermuda when described (Clark, 1982a), but also occurs on mangrove roots in Belize (*own obs.*) on Caulerpa racemosa. Mangrove seems to be the prime habitat in Belize, with *Rhizophora* roots providing a habitat similar to vertical rock walls in Bermuda. The Bermuda animals are probably a population on the northern fringe of its range.

5. *Oxynoe antillarum* Mörch, 1863
(Fig. 9)

Localities: common at Tobacco Bay, Whalebone Bay, and occasional specimens at Castle Harbour Causeway; on *Caulerpa racemosa* to depths of 3 m, in areas of good cir-

culation, usually occurring with *Volvatella bermudae* (Clark, 1982a).

Description: Body green, to 3 cm, with glossy, inflated shell covering middle body; shell partially covered by adherent parapodia; greyish spots on elongate, greenish tail, with scattered papillae on parapodia, tail and body. This species is easily confused with *O. azuropunctata* K. R. Jensen, but Bermuda specimens have planktotrophic larvae, so are *O. antillarum*.

6. *Elysia subornata* Verrill, 1901
(Figs. 10-14)

Synonymy:

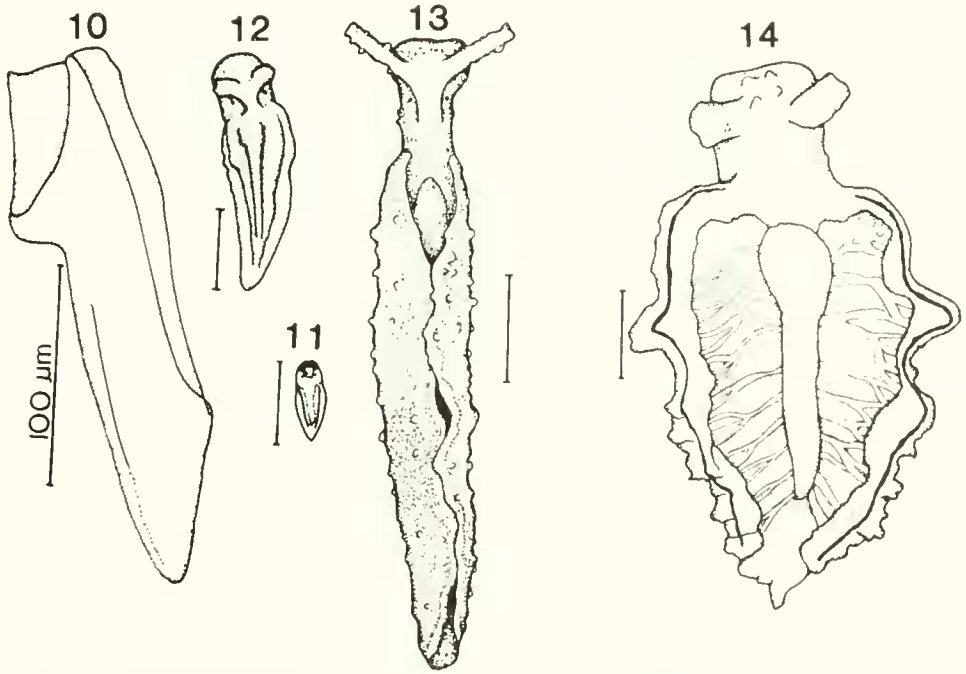
Elysia subornata Verrill, 1901 (Pp. 29-30, Pl. 4, Fig. 4; Castle Harbour, Bermuda).

Elysia cauze Marcus & Marcus, 1957 (Pp. 405-410, Figs. 35-44; Sao Sebastiao Island, Brazil).

Localities: very abundant at SW end of causeway, Castle Harbour; common at Tobacco Bay, Whalebone Bay, Bailey's Bay; on *Caulerpa racemosa*, to 2 m.

Description: Specimens within single populations were often highly variable in coloration, ranging from yellow green to dusky olive to reddish, usually with brownish to black parapodial margins (pale or absent in some specimens). Parapodial margin thickened, whitish. Parapodia usually minutely papillose, sometimes smooth; heavily ruffled in larger specimens. Parapodia often bear white spots, with or without black rings. Rhinophores usually banded with irregular transverse grey or white band, with distal transverse brownish band. Small juveniles show the distinctive black "facial mask" described for Florida specimens (Clark *et al.*, 1979). Renopericardium long (ca. ½ total body length), extending most of distance to tip to tail, with about 10 vessels extending perpendicularly from each side to the base of the thickened parapodial margin, branching more or less dichotomously, sometimes anastomosing (Fig. 14). Radular tooth minutely denticulate (Fig. 9). Body length to 50 mm; one of the largest Atlantic ascoglossans.

Comments: the range of variation of the specimens collected here includes all characteristics of Verrill's (1901) brief description and figure (except that the marginal line of the parapodia is rarely orange-brown) and does not significantly differ from characteristics of *E. cauze*. The marginal black band is a character found in several described and undescribed



FIGS. 10-14. *Elysia subornata*. **10.** Tooth. **11, 12.** Juveniles. **13.** Adult, at rest. **14.** Adult, parapodia extended to show pericardial complex.

Caribbean and Florida *Elysia*, but as Marcus (1980) notes, the long renopericardium and the dorsal vessel pattern "are an exceptional feature of the species." Although Bermuda animals are more variable in color than Florida populations, there seems no valid reason to regard them as a distinct species.

The unusual reddish color of specimens from Castle Harbour causeway was associated with relatively eutrophic water and a consequent growth of reddish epiphytic Cyanophyta on the *Caulerpa*.

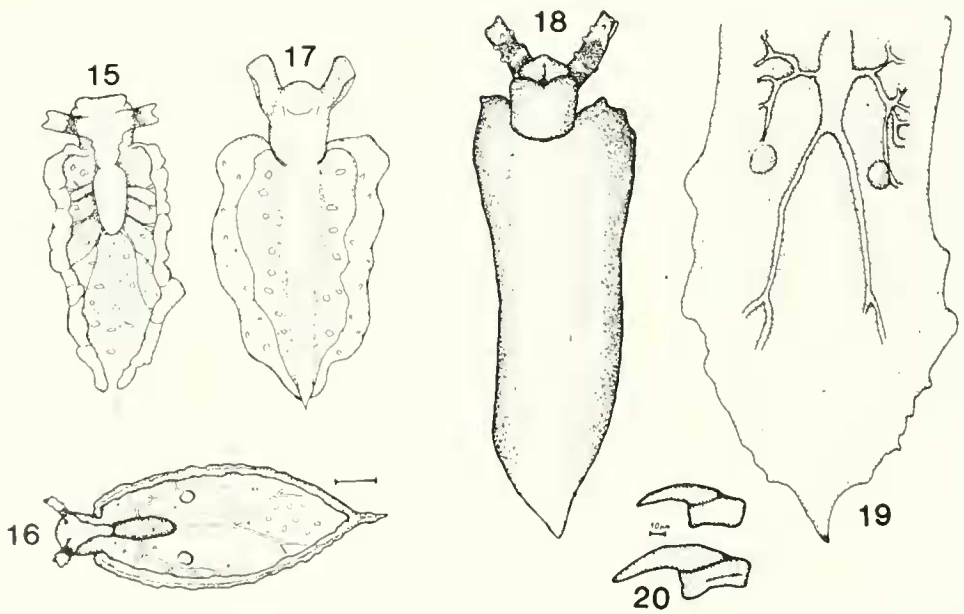
7. *Elysia papillosa* Verrill, 1901
(Figs. 15-20)

Synonymy:
Elysia papillosa Verrill, 1901 (p. 31, Pl. 4, Fig. 3; Hungry Bay, Bermuda).

Localities: widely distributed: Castle Harbour; Bailey's Bay; Ferry Reach; Hungry Bay; Tucker's Town Bay; Harrington Sound; feeding upon *Halimeda* spp., *Penicillus*, and *Udotea flabellum*, to 4 m depth.

Description: Body pale green with thick white parapodial margins, white head and parapodia, brown transverse bands on parapodia, numerous white papillae on both surfaces of parapodia, head, and rhinophores; pericardium brownish; iridescent white blotches are scattered on the upper surface of the parapodia, increasing in size toward the tail. A line of scattered brown granules occurs on the white parapodial margin, forming a distinct black line in larger animals (> 1 cm). Foot lighter green than parapodia. A prominent sperm-filled vesicle lies at about the middle of each side of the upper parapodium surface. Pericardial hump short, with one to three pairs (dependent on size) of vessels radiating laterally, one pair posterolaterally (Fig. 19). In some specimens, especially larger ones, the posterolateral vessels originate as a single posteriorly directed vessel which divides part way between the pericardium and the tail (Fig. 19). Specimens from southern Castle Harbour, from *Udotea*, were olive green and lacked papillae but in other respects were typical *papillosa*.

Comments: Non-Bermudan records of *E. papillosa* are tied to a description of Florida animals (Marcus & Marcus, 1967), which noted that Verrill's description lacked critical characteristics. The present observation validates the Marcus' conclusion that non-Bermudan records represent the same species. *E. patina* Marcus, 1980 is similar to *E. papillosa* in the presence of "gametolytic vesicles" and dentition; a more thorough description of *patina*



FIGS. 15-20. *Elysia papillosa*. **15, 16.** Dorsal views of two animals, illustrating variability. **17, 18.** Ventral views. **19.** Pericardial complex, **20.** Teeth.

from living animals would aid separation of the two species. Dissection of "gametolytic vesicles" in several living animals of *E. papillosa* and Florida specimens of *E. patina* showed that they were filled with highly motile sperm; these structures appear to function as storage vesicles for viable sperm, and the term "gametolytic" should be replaced by "gametic" until function is defined.

8. *Elysia tuca* Marcus & Marcus, 1967
(Fig. 21)

Synonymy:
Elysia crispa (Mörch, 1863) Verrill, 1901.

Localities: common in Ferry Reach; Harrington Sound; on *Udotea, Halimeda,* and *Penicillus;* to 3 m, especially in areas of quiet water.

Description: Body dark green, with irregular iridescent white patches on parapodial margin and on head between rhinophores; parapodia smooth, held tightly rolled against midline of body, with distinct mid-length notch forming a ventilatory "chimney". Length to 15 mm.

Comments: This species is easily separable from all other Caribbean species by the parapodial notch, coloration, diet, and posture. Verrill's description noted the distinctive white patch between the rhinophores, but erroneously identified the species as *Tridachia crispata.* This has led to some confusion that *Tridachia crispata* occurs in Bermuda; it apparently does not. This also explains why *E. tuca,* which is ubiquitous throughout the Caribbean, has not been previously reported from Bermuda.

9. *Elysia flava* Verrill, 1901
(Figs. 22-24)

Synonymy:
Elysia flava Verrill, 1901 (P. 30, Pl. 4, Fig. 1)

Locality: A single specimen, collected by W. Sterrer, Hungry Bay, June 1979, depth 0.1 m.

Description: Body yellow, with irregular dark green longitudinal band extending along

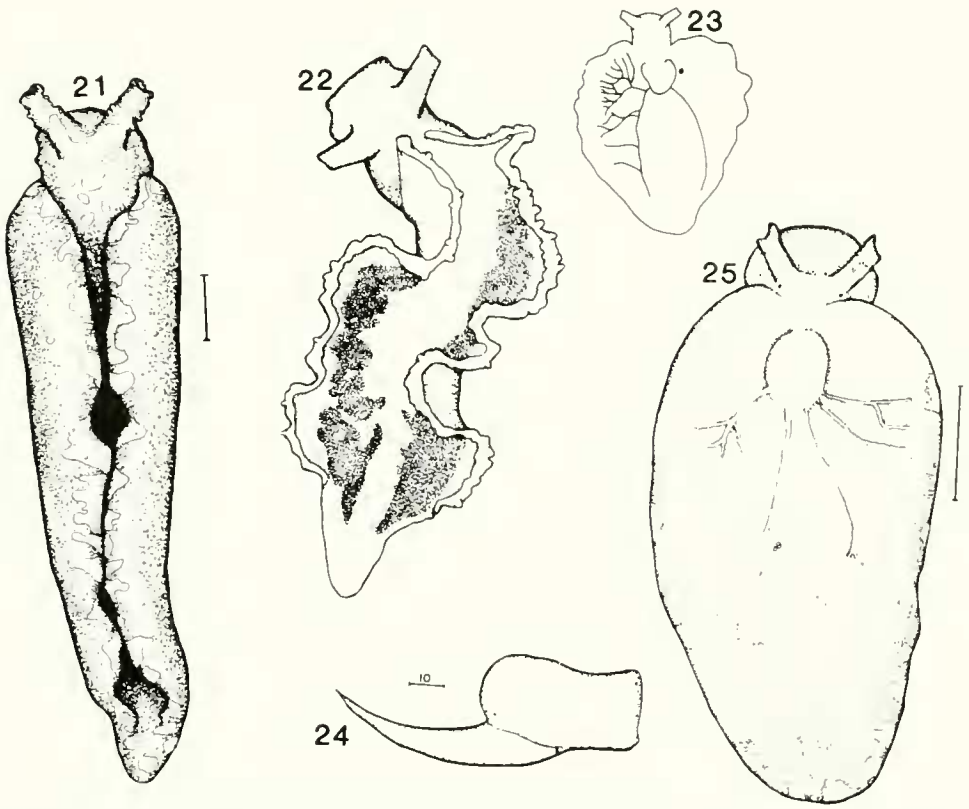


FIG. 21. *Elysia tuca.* FIGS. 22-24. *Elysia flava.* **22.** Dorsal view, from photo of living animal. **23.** Venation of pericardial complex. **24.** Tooth. FIG. 25. *Bosellia mimetica.*

parapodium on each side (color represents digestive diverticula); parapodial margin white. Pericardium short, with single posterolateral vessel on each side, which branches near pericardium (Fig. 0), forming a long posterad vessel with a dense cluster of anastomosing vessels. Teeth small (56-80 μm) and relatively uniform in length, with narrow cutting tip, edenticulate; 31 radular teeth in the single specimen.

Comments: Thompson's (1977) Jamaican record of *E. flava* is the first non-Bermudan record and correctly redescribes this species. The tooth of *E. flava* is similar to that of *E. papillosa*, suggesting that this species may feed on *Udotea*, but its diet is so far unknown. At the time of my visit to Hungry Bay, there were no visible Siphonales suitable as food for this species. It is possible that the yellow color of the parapodia is due to starvation. This species is quite similar to *E. papillosa* and *E. patina* Marcus, and further studies are needed to adequately define differences between these species.

10. *Bosellia mimetica* Trinchese, 1890
(Fig. 25)

Locality: One specimen, SW end of Ferry Reach; on *Halimeda*, d. 2 m.

Description: Body flat, plastic in outline, but elliptical when at rest, closely conforming with and adhering to scales of *Halimeda;* color deep green with white irregular patches, concentrated at margins. Pericardium ovoid, with about 5 dendritic posterolateral vessels. Tooth robust, strongly hooked, with strong denticles. L. 15 mm.

Comments: As Marcus (1982) notes, the genus *Bosellia* should be placed in its own family by virtue of its chromosome number. Also, the adherent flattened "parapodia" of *Bosellia* are distinctly different in morphology and function from those of *Elysia*, since they are not rolled but are used to adhere to the substrate. Actually, the "parapodia" of boselliids are not true parapodia, but represent a very broad foot; in elysiids, the parapodia are lateral extensions of the dorsolateral body wall and extend well beyond the foot, which is narrow and well-defined. In *Bosellia* the margin of the foot is directly joined to the dorsal body surface. Also, the radular teeth of *Bosellia* are quite different from those of elysiids which eat *Halimeda*. *B. mimetica* has a broad distribution, including Europe and the Mediterranean as well as throughout the Caribbean. In Florida, this species is most abundant in areas with heavy wave action (Jensen & Clark, 1983), and the broad foot may be adaptive to this high-energy habitat.

11. *Cyerce antillensis* Engel, 1927
(Figs. 26-29)

Locality: Ferry reach, uncommon on *Penicillus dumetosus*, to 1 m.

Description: Body whitish to yellowish, occasionally deep green, with flat, colorless, transparent cerata. Body flattened, with broad foot. Cerata easily detached, adhesive, lacking digestive diverticula. Rhinophores deeply bifid, rolled.

12. *Cyerce cristallina* (Trinchese, 1881)
(Figs. 30-31)

Synonymy:
Lobiancoia cristallina Trinchese, 1881 (P. 116, Figs. 1-12; Naples, Italy).

Locality: Hungry Bay, a single specimen coll. by W. Sterrer, 1 m. depth.

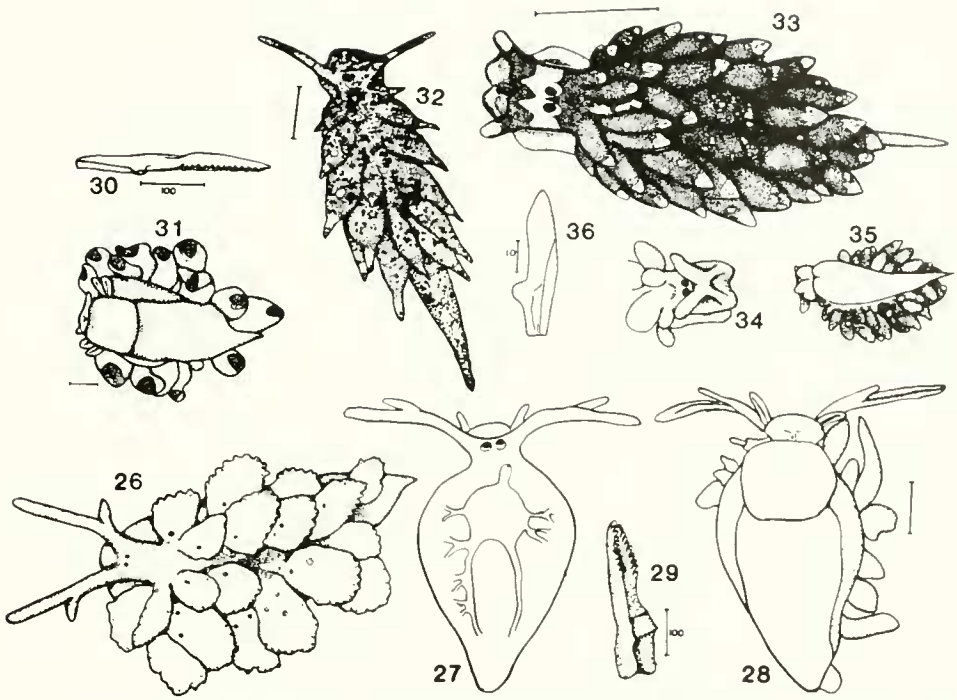
Description: Body translucent, whitish, with conspicuous white patches on head, rhinophores, and transparent cerata, and bright red patches overlying the white. Radular teeth very long (300 μm) and constant in length; about 15 denticles per side. Length 7.5 mm.

Comments: The bright coloration of this species easily separates it from *C. antillensis*. *C. cristallina* is far less common than *C. antillensis*, and its diet and development are unknown.

Costasiellidae, **New Family**

As Clark (1982b) noted, the genus *Costasiella* is transitional in characteristics between Stiligeridae and Caliphyllidae, but differs in most characteristics from the other transitional hermaeid genera *Hermaea* and *Aplysiopsis*.

Diagnosis: ceratiform Ascoglossa with large admedian eyes, fusiform non-flattened cerata, unifid auriculate or digitiform rhinophores broadly joined to the snout via the anterior edge; digestive diverticula usually knobby, in grapelike clusters within cerata; genital apertures polyaulic (rather than diaulic as in *Hermaea* or *Aplysiopsis*). Foot rather narrowly



FIGS. 26-29. *Cyerce antillensis*. **26.** Dorsal view, from photo. **27.** Pericardial complex. **28.** Ventral view (p-penis). **29.** Tooth. FIGS. 30-31. *Cyerce cristallina*. **30.** tooth. **31.** Ventral view. FIG. 32. *Costasiella ocellifera*. Dorsal view, from photograph. FIGS. 33-36. *Costasiella nonatoi*. **33.** Dorsal view. **34.** Head. **35.** Ventral view. **36.** Teeth.

triangular; radular teeth non-denticulate; esophageal diverticulum absent; visceral loop with three ganglia. Diet, *Avrainvillea* for species with known diet; distribution tropical.

13. *Costasiella ocellifera* Simroth, 1895
new combination
(Fig. 32)

Synonyms:

Doto ocellifera Simroth, 1895 (Pp. 168-170, Pl. 20, Figs. 6-10; St. George's Harbour, Bermuda)

Stiliger lilianae Marcus & Marcus, 1969 (Pp. 7-12, Figs. 22-28; Sao Paulo, Brazil)

Costasiella lilianae (Marcus & Marcus), Baba, 1970

Costasiella lilianae (Marcus & Marcus), Thompson, 1977

Localities: Ferry Reach; Bailey's Bay; common on *Avrainvillea* to 2 m.

Description: Color whitish, but appearing deep green, due to dense chloroplasts in digestive diverticula; cerata and body covered with scattered large black round chromatophores; faint orange rings surround cerata near distal tip; bluish-green iridescent spots and small whitish glands scattered on cerata; a green iridescent spot, surrounded by a yellow ring, is located between the large eyes and the pericardium. Rhinophores long, cylindrical, tapering, with auriculate base; cerata pyriform (fusiform in relaxed animals), arranged in five to six diagonal rows on each side, four cerata per row; cerata separated from the foot by a shallow furrow. Posterior foot divided by transverse groove and containing digestive diverticula, appearing much like a ceras. Radular teeth uniform in size, about nine teeth in the ascending arc and 10-12 in the descending; ascus absent.

Comments: Ferry Reach, from which the present material was collected, is an extension of Simroth's type locality, St. George's Harbor. His figures, apparently of preserved material, clearly show the grape-like digestive diverticula, large admedian eyes, and conspicuous melanophores of the species later described as *Stiliger lilianae*. Simroth's Fig. 8 also shows the distinctive eye structure (heavily pimented cup enclosing a hyaline lens) as shown by Marcus & Marcus (1969, Fig. 27) for *St. lilianae*. Simroth's figure of the radula (his Fig. 10) appears slightly different than teeth of *Costasiella*, as if he failed to include the laminar edge of the tooth. This

may be the result of uncritical observation, but the teeth as figured are definitely ascoglossan, and show the uniform size of *C. lilianae*. Simroth also failed to note any transverse demarcation of the posterior foot, but the remaining similarities are so striking that *C. lilianae* is undoubtedly a junior synonym.

Colors of the "eyespot" anterior to the pericardium vary: Florida specimens have a blue spot with orange ring (personal. observation) and Jamaican specimens a yellow ring and blue spot (Thompson, 1977).

14. *Costasiella nonatoi* Marcus, 1960
(Figs. 33-36)

Synonymy:
Costasiella nonatoi Marcus & Marcus, 1960 (Pp. 149-152, Figs. 26-33; Ubatuba, Middle Brazil).
Placida nonatoi (Marcus & Marcus, 1960) Marcus & Marcus, 1963.

Locality: Uncommon on *Avrainvillea nigricans* in Ferry Reach, occurring together with *Costasiella ocellifera* to 2 m.

Description: Body whitish, with much melanic pigmentation. Cerata black, except tips, with greenish knobby diverticula visible in some specimens; scattered white areas toward tips of cerata. A distinctive whitish mask surrounds the large black eyes. Rhinophores short, with white tips, fused to each other anteriorly and to the snout at their anterior base; snout of head forming two broadly rounded lobes. Cerata clavate, arranged in 3-4 densely packed rows on each side. Foot not transversely divided; tail long and narrow. Length, to 5 mm.

Comments: Individuals burrow into the felty thallus of *Avrainvillea* to feed and deposit egg masses, and are difficult to collect because this prevents easily dislodging animals. The small size of the adults and melanic coloration also makes them difficult to observe while in the alga. This habit differs from that of *C. ocellifera*, which crawls directly on the surface of the alga, and may represent a fine partitioning of an otherwise highly similar niche. The melanic coloration and location within the alga makes retention of symbiotic chloroplasts in this species unlikely, though *C. ocellifera* is one of the best examples of this phenomenon (Clark *et al.*, 1981).

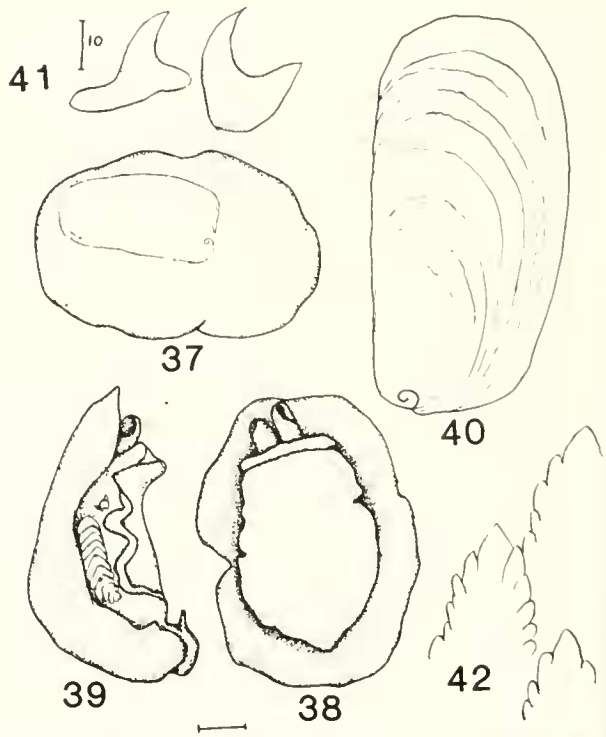
15. *Berthella agassizii* (MacFarland, 1909)
(Figs. 37-42)

Synonymy:
Pleurobranchus agassizii MacFarland, 1909 (Pp. 59-64, Pl. 11-12, Figs. 43-57; Riacho Doce, Alagoas, Brazil).
Bouvieria agassizi (MacFarland, 1909) Odhner, 1926

Locality: Hungry Bay (coll. by S. Gardiner); Gravelly Bay; under rocks, depth 1 m.

Description: Color white, pink, or orange; shell internal, flat, nearly rectangular, slightly longer than half of mantle length, transparent in living animal, with strong growth lines and flat spire. Notum smooth to "orange peel" texture, overlapping foot; gill rachis nontuberculate, with 12-14 plumules on each side of axis; anus above third or fourth gill leaflet. Radular teeth thornlike (Fig. 41); Jaw scales with 7-11 strong denticles.

Comments: This species closely matches the description of *Pleurobranchopsis aurantiaca* Verrill, 1900, except that Verrill's description explicitly noted the absence of a shell. As noted here, the shell is highly transparent and easily overlooked in live animals, and this might explain Verrill's establishment of the shell-less



FIGS. 37-42. *Berthella agassizii*. **37.** Dorsal view, preserved animal. **38.** Ventral view. **39.** Right lateral view. **40.** Shell. **41.** Teeth. **42.** Jaw scales.

genus *Pleurobranchopsis*. Willan (1978) reviews the history of *Pleurobranchopsis* and *Gymnotoplax*, which appear to be based on inaccurate description and damaged specimens. However, Verrill's description of *P. aurantiaca* lacks sufficient diagnostic characteristics to allow synonymy with *B. agassizi* in the absence of the holotype; thus, *P. aurantiaca* and *P. nivea* must remain *nomina dubia*. *Berthella tupala* Marcus, 1957, differs from *B. agassizi* by melanic pigmentation of the shell and differences in jaw scales.

16. *Chromodoris bistellata* (Verrill, 1900)
(Fig. 43)

Synonymy:
Doris bistellata Verrill, 1900 (P. 548, Pl. 66, Fig. 2; Castle Harbour).

Locality: Coney Island, summer 1976.

Description: Gills 5, simply pinnate (Verrill notes 7) with alternating leaflets; mantle skirt high, as in *Hypselodoris;* Radular teeth hamate, non-denticulate, tapering in size from adlaterals (48 μm) to admedian (36 μm), 30 × 36.0.36. Notum deep brown, with two white stellate spots and scattered flecks of white. The dentition of this species clearly places it in *Chromodoris*. The preserved animal is 5 mm length; Verrill's original specimens were 15-20 mm.

17. *Okenia zoobotryon* (Smallwood, 1910)
new combination
(Figs. 44-47)

Synonymy:
Polycerella zoobotryon Smallwood, 1910 (PP. 143-145, Fig. 10; Agar's Island (?), Bermuda)
Bermudella zoobotryon (Smallwood, 1910) (Odhner, 1941)
Okenia evelinae Marcus, 1957
Cargoa evelinae (Marcus, 1957) (Vogel & Schultz, 1970)

Locality: Hall's Island, Harrington Sound, on the bryozoan *Zoobotryon pellucida*, under rock ledges 1-5 m.

Description: Radula 1.1.0.1.1 × 18; lateral 50 m wide, with about 11-12 denticles; marginal 20 μm wide, with distinct notch on distal edge. Body white with brown spots scattered on spiculate notum; foot narrow, with slight foot

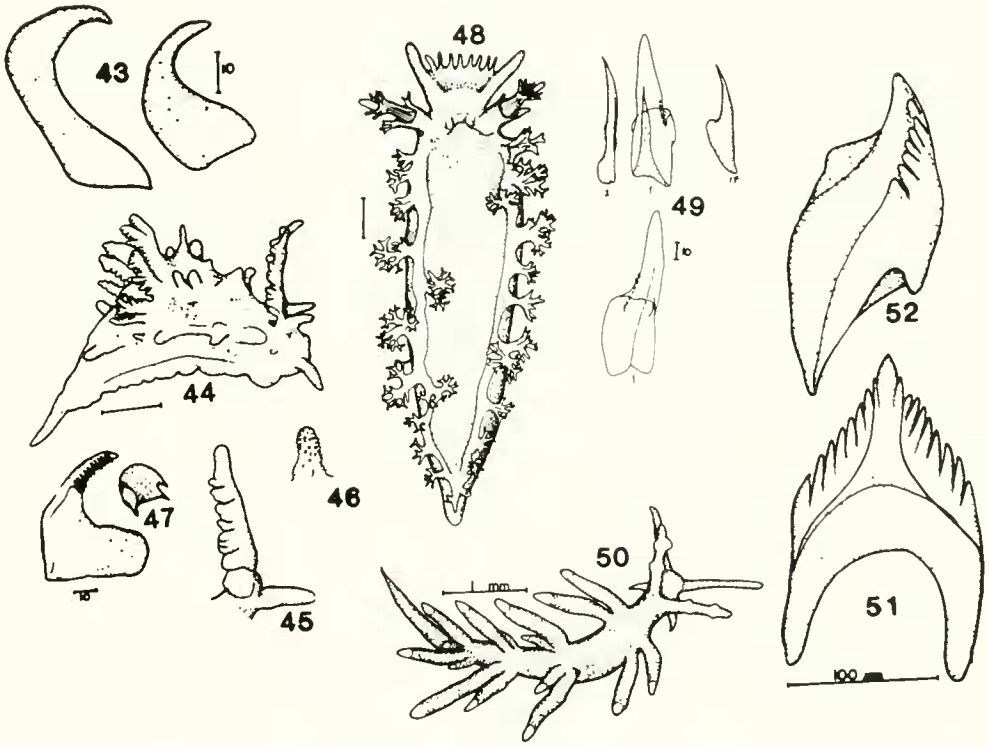


FIG. 43. *Chromodoris bistellata*, teeth. FIGS. 44-47. *Okenia zoobotryon*. **44.** Lateral view. **45.** Rhinophore. **46.** Papilla. **46.** Teeth. FIG. 48. *Tritonia frydis*. **48.** Dorsal view. **49.** Teeth. FIG. 50. *Favorinus auritulus*, from photo of live animal. FIGS. 51-52. *Dondice occidentalis*, teeth. **51.** Vertical view. **52.** Lateral view.

corners. Pallial ridge bears several short papillae; pericardial hump guarded by two papillae on each side; up to 7 simply pinnate gills. Rhinophores white, with 5-7 cup-shaped lamellae (irregular in relaxed animal), blunt anterior-pointing basal spur. Notal papillae studded with small tubercles, possibly toxic. L. to 6 mm.

Comments: This small dorid is highly conspicuous on the transparent masses of *Zoobotryon*, collected from the type locality of *Polycerella zoobotryon* in Harrington Sound (Smallwood, 1910). The present material agrees in all respects with Smallwood's type description, but he later described the radula in a secondary description (Smallwood, 1912) with three lateral teeth. In other respects, the similarity is so strong that this secondary description must be regarded as erroneous or possibly variable. In my material, the laterals stained very poorly with acid fuchsin and most scattered during preparation, so this discrepancy may be understandable, and may explain why this species has not been properly placed before. *Okenia evelinae* differs only in color of the rhinophores (purple) and size and number of rows of radular teeth, which may be due to variations in diet and size. Specimens from Sebastian Inlet, FL also feed on *Z. pellucidum* and have the same coloring as Bermuda specimens. Vogel and Schulz (1970) differentiated *O. cupella* from *O. evelinae* solely on the basis of the number of cupped rhinophoral lamellae. As their specimens were quite small (2 mm), this may be an unreliable character and this species is probably synonymous.

18. *Tritoniopsis frydis* Marcus & Marcus, 1970
(Figs. 48-49)

Locality: West of Nonsuch Island, Castle Harbour, on base of *Gorgonia*, 3 m. This area contains scattered corals and has a heavy algal growth. Three specimens, to 0 mm.

Description: Body white to orange; dorsal papillae 8-12 per side, dendritic, brownish, resembling gorgonian polyps. Rhinophoral sheaths and clubs similarly dendritic. Oral veil with 2 large and about 8 short digitiform tentacles. Anus midlateral. L to 20 mm.

19. *Favorinus auritulus*
Marcus & Marcus, 1955
(Fig. 50)

Locality: Ferry Reach, on *Penicillus* and *Caulerpa*, where it feeds on the eggs of other opisthobranchs; depth, to 2 m.

Description: The knobbed rhinophores, short, recurved foot corners, and oral tentacles of the same length as the rhinophores characterize this small (5-12 mm) aeolid. Cerata in 3-4 small groups. Color dull white or beige. Radula uniseriate, unicuspid, non-denticulate. This species is easily cultured and can become a "pest" contaminant of cultures of other slugs.

20. *Dondice occidentalis* (Engel, 1925)
(Figs. 51-52)

Synonymy:
Caloria occidentalis Engel, 1925 (Pp. 41-44, Figs. 7-15; Montego Bay, Jamaica.)

Locality: Pt. Shares, Great Sound, July 1979.

Description: This species is easily recognized by the black jaw epithelium, visible through the head in living or preserved animals. Radula uniseriate; tooth with 8 denticles, the first pair smaller and closely adherent to the central cusp; jaw denticles were not visible in the single preserved specimen. Oral tentacles very long, foot corners short. Cerata in six groups. Color whitish; iridescent white patches on head, nape, and sides visible in preserved animal. Length of preserved animal 9.5 mm.

Comments: This species agrees in some physical characteristics with *Facelina* (?) *goslingii* Verrill, 1901, but that species has radular teeth with 10-12 denticles of decreasing size, black jaws are not mentioned, and there are differences in coloration. The differences in dentition alone are enough to separate the two species.

Discussion

Prior to this study, Bermudian opisthobranchs appeared to have a large proportion of endemic species. However, when synonymies are considered, this proportion falls, and the predominantly Caribbean characteristics of this group are evident. The largest endemic component is seen among the dorid Nudibranchia, in which several of Verrill's species (*Doris olivacea, Lamellidoris lactea, Lamellidoris quadrimaculata, Chromodoris roseopicta, La-*

mellidoris aureopuncta, Lamellidoris miniata) are dissimilar from known Caribbean species. The nudibranchs are fairly well-known from other Caribbean studies (see Marcus, 1980, for a summary), and it appears that most of these species are true Bermudian endemics.

Resolution of the status of these species must unfortunately depend on re-collection, as generic placement by current standards is quite dubious. Most of the remaining endemic species of questionable status were collected in spring, hence their absence in the present study is not evidence of non-occurrence. However, increasing human activity in Bermuda, with consequent alteration of habitat, creates a distinct possibility that these species may have disappeared, or will disappear, from Bermuda waters. In such case, the identity of these species may never be resolved, and efforts should be made to collect and redescribe these species at the earliest opportunity.

The densest populations of Bermudain opisthobranchs seem to be those species with brevipelagic development (e.g. *Elysia subornata, Elysia tuca, Elysia papillosa, Costasiella ocellifera, Bulla striata, Haminoea antillarum*). Species with extended pelagic development are, in contrast, sparse in population though well-represented in number of species (e.g. *Elysia ornata, Bosellia mimetica, Oxynoe antillarum, Tritonia frydis*), particularly when compared with mainland Florida populations with similar food resources. This suggests that species with pelagic development recruit primarily via allochthonously produced larvae originiating on Bahaman or other Caribbean shores, and that such Bermudian species are effectively sterile populations. If this is true, one might predict that 1) brevipelagic development will dominate among Bermudian endemics, and 2) Bermudian species with brevipelagic development will be genetically more distant from Caribbean conspecifics than species with longipelagic development.

Some interesting taxonomic questions remain. Smallwood's *Facelina agari*, with tuberculate rhinophores, probably belongs in *Berghia*, but the description, from a single animal, gives very few useful characteristics. The primitive sketch of the animal (Smallwood, 1910) is of little use in identification. Several others of Verrill's species (*Coryphella pallida, Runcina inconspicua, Facelina goslingii*) require further evaluation, as they cannot reliably be placed even to genus without reexamination.

Additional, previously recorded species of Bermuda Opisthobranchia are summarized and illustrated in Jensen and Clark (in press).

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